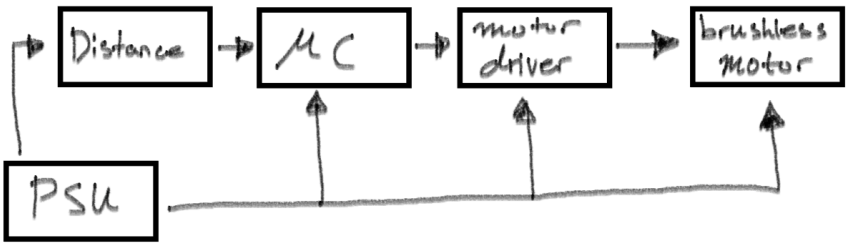
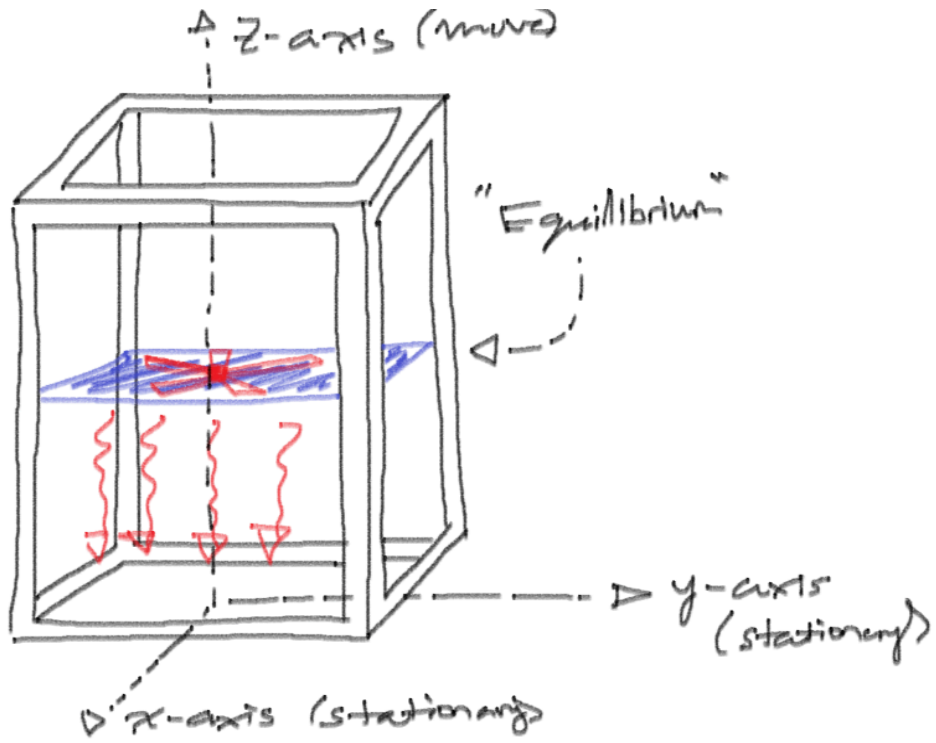
Logbook

09/09/2025

- The original idea was to make a drone, but it is way too complicated for one semester.
- Our project can be described as a dumbwaiter that uses a propeller instead of mechanical parts.
- We are using a single motor to power a propeller that goes up to a point considered "equilibrium". Weight, push, or pull forces can be done on the propeller. That would lead to the propeller increasing or decreasing speed to get back to the "equilibrium" point.
- The electronics we so far need are as follows: switches (x2), psu (x1), distance sensor (x1), brushless DC motor (x1), motor driver (x1), and microcontroller (x1).
    - Distance sensor we might use
    - Have to talk about it but might add a display
- A frame of sorts is going to be needed to keep the propeller stationary in the x and y direction, only moving in the z direction.
- Current block diagram:



- Possible design:



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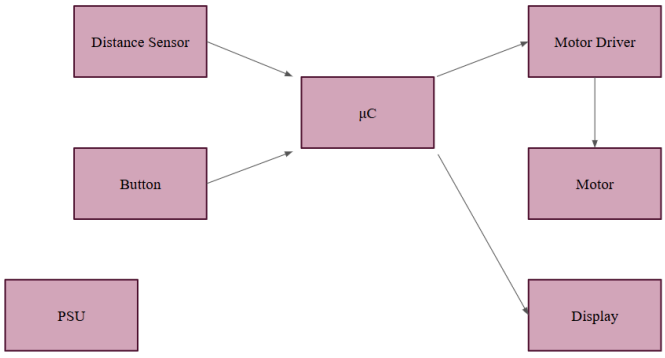
09/11/2025

- There is another possible design for the frame that uses like 3 to 4 poles and that is what keeps the drone travelling only on the z-axis.
- We have decided that the drone will have all of its electrical components in one place which means the frame is just a structure to hold it in place.
- The button to turn the drone on and off will be on one side which keeps us away from using wires to connect all the electronics together.
- The electronics will probably mostly be placed in the center or in a way that the weight is evenly distributed.
- The motor and propeller we use will have to create enough downward force to move the drone up and down.
- The electronics we so far need are as follows: switches (x1), psu (x1), distance sensor (x1), brushless DC motor (x1), motor driver (x1), and microcontroller (x1). We also have to look into a voltage regulator since the drone would be running on a battery for power.
- Updated block diagram from last time:



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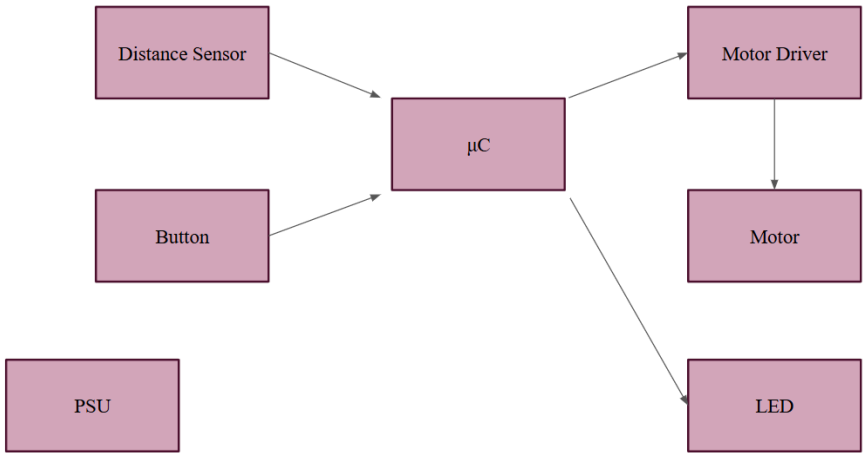
09/14/2025

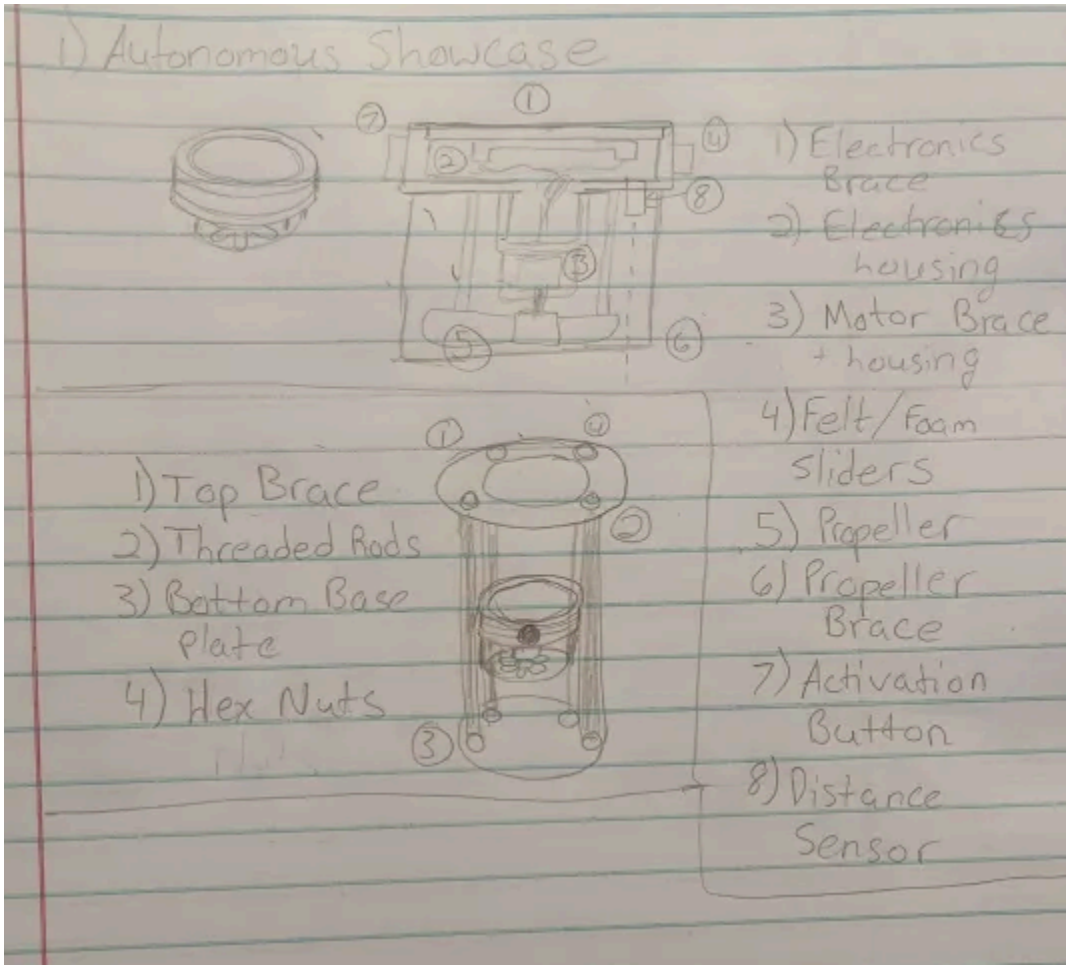
- New block diagram:



- Originally, we were thinking of using a display for giving user feedback about the drone but an LED was decided to be easier for this current prototype.
- The electronics we so far need are as follows: switches (x1), psu (x1), distance sensor (x1), brushless DC motor (x1), motor driver (x1), LED (x1), and microcontroller (x1). We also have to look into a voltage regulator since the drone would be running on a battery for power.
- Links to some electronics:
    - Microcontroller - Multiple ones we can choose from
    - Distance Sensor - The one professor talked about
    - LED - Any RGB LED will do, just have it there for reference
    - Button - Just have this button for reference, what ever is best
- Looking into motors, specifically for drones, there are some things to be aware of. Most specify the number of cells the LiPo battery has using “xS”. So 4S is 4 cells in series. To find the thrust they can produce, we can just look at the manufacturer’s info.
    - Possible motor with ESC - So the number of cells needed would be 4S and can max thrust 1024 g. From reading online, a good thrust-to-weight ratio is 2:1 for the basic movements of a drone which should be more than enough for us. The motor and ESC need like 4s which is almost 15 volts.
- A single LiPo cell is around 3.7 volts.
    - Possible battery
- Need a buck converter. If not, the battery will kill the ESP32.
- Possible names: AirLift or HMS (Height Maintenance System).

Logbook

- Other possible design:



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09/17/2025

- Concern arose about horizontal space dedicated to house the laser. Having the laser hang over the propeller would risk the distance data being skewed.
    - By pushing the laser to the outer perimeter of the propeller's range, we increase the overhang of the drone.
- Looked into the electronics we will use again and landed on this possible list:
    - Distance - https://www.adafruit.com/product/3317?srsltid=AfmBOophG-wvvBTgmJzAP-8jhGge4Poar271QmEji-KDwoUUaXPynfFA
    - Microcontroller - https://www.digikey.com/en/products/detail/espressif-systems/ESP32-S3-DEVKITC-1U-N8R8/16162636?gclsrc=aw.ds&gad_source=1&gad_campaignid=20243136172&gbraid=0AAAADrbLlgtgkG_Jm-L0YhXZI2s1SPaw&gclid=Cj0KCQjwuKnGBhD5ARIsAD19RsaObch_tm6VN9gXY12hmXCuD3Y-r59kiRYJ3PIVZ3_igxLuZIO8syMaApcsEALw_wcB
    - Motor - https://www.getfpv.com/brotherhobby-vy-1504-5-2650kv-2950kv-3950kv-motor.html
    - ESC - https://www.getfpv.com/v-good-rc-32-bit-30a-2-4s-brushless-esc-for-rc-airplane.html?afid=aVlOV0hBdmd6THc9&referring_service=google-cpc&utm_source=google&utm_medium=cpc&utm_campaign=DM%20-%20NB%20-%20PMax%20-%20Shop%20-%20No-index%20-%20SM%20-%20ALL%20%7C%20Full%20Funnel&utm_content=pmax_x&utm_keyword=&utm_matchtype=&campaign_id=20799936859&network=x&device=c&gc_id=20799936859&gad_source=1&gad_campaignid=20796067361&gbraid=0AAAAAD8cN5LjXoJDnIXa5zmCuLtj7zxSZ&gclid=Cj0KCQjwuKnGBhD5ARIsAD19RsYVdS8y1Dh9E5zQdFk1-bCXJuklTw65ExcxBI9Z00ZKhiOYvTiip78aAuW0EALw_wcB
    - Battery - https://www.getfpv.com/batteries/mini-quad-batteries/lumenier-550mah-4s-80c-lipo-battery-xt-30.html
    - LEDs and Buttons are just generic, don't have to be anything special
- Decided on two LEDs: one red and one green. This will tell the user when they can actually interact with the drone.

Logbook

09/18/2025

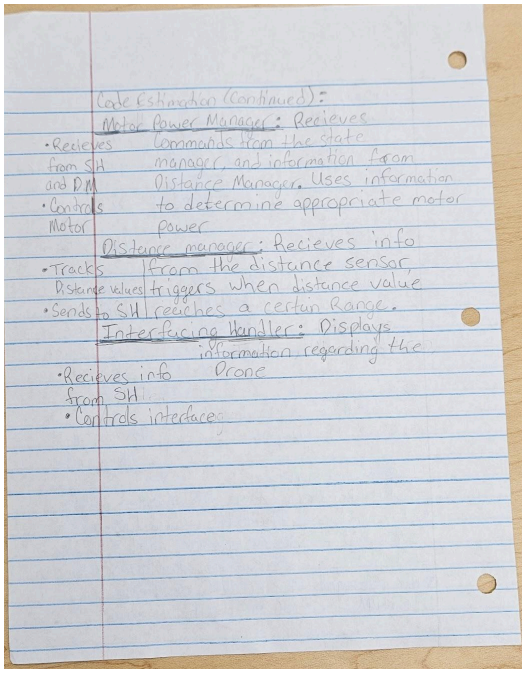
- Current Bill of Materials:

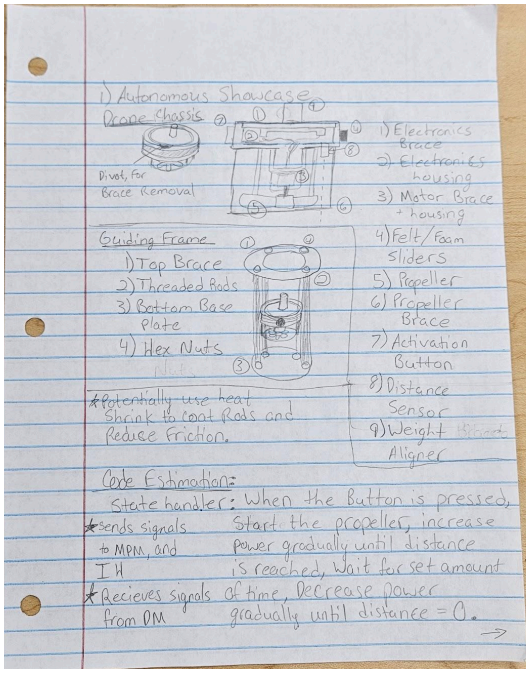
Electronic	***Link to Market Place***	***Status***	***Cost***
Microcontroller	ESP32 S3	Bought	
Motor	XING-E PRO 2207 2450KV	Available	
ESC		Available	
Distance	Adafruit VL53L0X Time of Flight Distance Sensor	Available	
PSU	Lumenier 550mAh 4s 80c Lipo Battery (XT-30)	Available	
Charger	Gens Ace iMars Mini G-Tech 60W 2-4S 5A	Available	
Propeller	Gemfan Hurricane SL 5125 3-Blade Propeller	Available	
LED	N/A	Bought	
Button	N/A	Bought	
Buck Regulator	N/A	Available	
LDO	N/A	Available	
3.5V Beeper	N/A	Available	
TVS diode	N/A	Available	
polyfuse at V in	N/A	Available	
capacitors	N/A	Available	
MOSFET	N/A	Available	

- Trying to buy most electronics to be able to begin getting things to run.
- Added extra components for the safety of the main electronics.
- https://esp32.com/viewtopic.php?t=20450 Info on how to interface with the ESC Using the ESP32. It might be a bit of a hassle, but according to this it's possible.

Logbook

09/24/2025

- Updated the README in github
- Buying the components by today and making sure they have datasheets to go with the electronics.
- Division of work for the project: Alec - Programming, Angelo - CAD, Cristian - PCB
- 

- 

- https://www.instructables.com/Build-Custom-ESP32-Boards-From-Scratch-the-Complet/
- Maybe it would be good to have two buttons: one that turns the drone on/off and another that initiates hovering and the other to land. The latter would have three states. The first is

standby, then hovering, and finally landing. After the landing, the button would go back to the standby state so the drone could be turned off. Just have to think of the code so the drone can turn on and off safely.

Logbook

09/30/2025

- Have two 4.7 k ohm resistors parallel to SDL and SDA lines connected to the voltage value of the ESP32. They can stay open assuming they don't end at some sensor.
- The GPIO pins for SDL and SDA for the ESP32 we are using are 21 and 22. 21 is SDA and 22 is SCL.
- upesy.com/blogs/tutorials/esp32-pinout-reference-gpio-pins-ultimate-guide
- Have to check which GPIO pins are going to be used and which ones can be marked for no use.
- Waiting mostly on the ESC to be used to see if voltage regulators are needed or if the ESC has it itself.
- Distance Sensor Library
- ESP32 Servo Library

Logbook

10/01/2025

- Found some resources in order to make our own ESC for the actual prototype.
- We are going to have to use a ST-Link to program the STM chip with AM32. AM32 is the firmware used for STM chips which have a 32 bit ARM processor.
- https://www.youtube.com/watch?v=3mfhvqVV2zU&t=759s
- https://www.youtube.com/watch?v=K9toWUsjgkE&list=PLoPtpxJIxgnbG5owAAyvgVvzenaRd1DPr&index=3
- https://www.youtube.com/watch?v=sau_KQx4EIA&list=PLoPtpxJIxgnbG5owAAyvgVvzenaRd1DPr&index=3
- https://github.com/am32-firmware/AM32/tree/main/.github
- https://www.adafruit.com/product/2548?srsltid=AfmBOoqkTr_fbSsH5R0_MM4-w0A9GubkFuPw8c7s58bJDRa3OcuouBMfHI4

Logbook

10/06/2025

- Changed the BOM and Design Decisions to reflect the electronics needed for the Proof of Concept. The extra electronics are for the actual PCB design and can be omitted for now.
- Since sensitive parts need 3.3V, and battery can run out and drop below that, a warning system for this is needed, hence a beeper starting at around 3.5V
    - planned part: 1-8S LiPo Low Voltage Buzzer Alarm
- Miscellaneous parts to foolproof it from getting fried from mistakes
    - 22-100 µF electrolytic on input to MP1584 buck, plus 0.1-1 µF ceramic at X5R/X7R
    - polyfuse at battery input to protect buck/ESC/etc. (to protect ESP from bursts of current)
    - p-channel MOSFET, backwards to block reverse polarity, as diode with low drop (to not fry stuff if battery is connected incorrectly)
- TVS diode is needed because plugging/unplugging LiPo, or motor switching noise, might be an issue due to voltage spikes
- Buck Regulator MP1584, sensitive parts (esp32, sensors) need 3.3V or they get fried
- LDO (one of the following parts will suffice; LDO needed to clean up noise of buck reg)
    - AMS1117 − 3.3
    - AP7333